43 (ARC-2) 2·5

2018

STRUCTURE-II

Paper : ENG 2·5

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. (a) What are the different types of strains ? 5

(b) Derive an expression for deformation of a member due to external load. 5

(c) A rod $1m$ long and of diameter $1{\cdot}2cm$ is subjected to an axial pull of $12kN$. If the modulus of elasticity of the material of the rod is $2\times10^5 N/mm^2$, Determine 5

(i) the stress

(ii) the strain and

(iii) the elongation of the rod.

(d) A bar of 5*cm* diameter and 400*cm* long is acted upon by a load of 10 tonnes. It is found to extend 10*cm*. Find *(i)* Young's Modulus *(ii)* Work done. 5

2. (a) Derive the relation between Poisson's ratio, Bulk Modulus and Young's modulus of elasticity. 5

(b) A bar of 30*mm* diameter is subjected to a pull of 60*kN*. The measured extension on gauge length of 200*mm* is 0·1*mm*. Calculate *(i)* Young's Modulus *(ii)* Poisson's ratio *(iii)* Bulk Modulus. 10

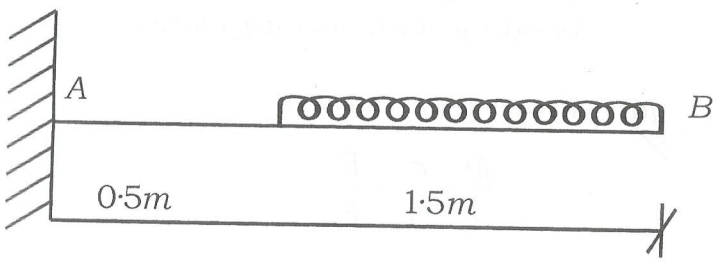
(c) A steel rod 5*m* long and 30*mm* in diameter is subjected to an axial tensile load of 50*kN*. Determine the change in length. Take $E=2\times10^5\ N/mm^2$ and Poisson's ratio = 0·25. 5

3. (a) Derive the relation between Modulus of rigidity, Young's Modulus of Elasticity and Poisson's ratio. 10

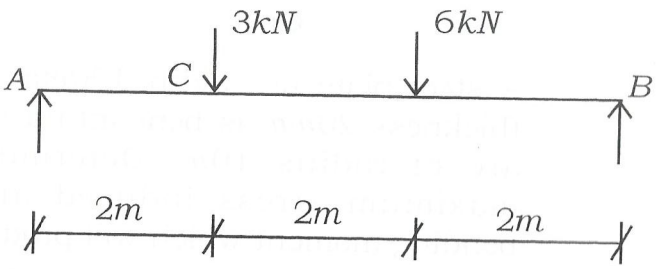
(b) Determine the poisson's ratio and bulk modulus of a material, for which Young's modulus is $1{\cdot}2\times10^5 N/mm^2$ and modulus of rigidity is $4{\cdot}8\times10^4 N/mm^2$. 5

(c) Define Hook's law with appropriate graph. 5

4. (a) Draw SFD and BMD. 10



(b)



10

5. (a) Explain shear force and Bending Moments.
Write down about different types of beams, depending on the way the beams are supported. Support your answer with relevant sketches. 3+7=10

(b) A cantilever beam AB of length '*L*' fixed at end B and free at end *A*, carries a udl of 'W' *kN/m* throughout its length. Develop the general expressions for the shear force and bending moment diagram. 10

6. (a) Derive the expression for the bending stress in simple beam. 10

(b) Write down the theory of simple bending with assumptions. 10

7. (a) Prove the relation 20

$$\frac{M}{I}=\frac{\sigma}{y}=\frac{E}{R}$$

Or

A steel plate of width $120mm$ and of thickness $20mm$ is bent into a circular arc of radius $10m$. Determine the maximum stress induced and the bending moment which will produce the maximum stress. Take $E=2\times10^5\ N/mm^2$.